MODULAR FLOORING SYSTEM WITH FRAMED TILES

The invention relates to a modular floor covering with tiles and exposed modules for framing the said tiles and contributing towards the aesthetic appearance of the covering. The invention relates in particular to a modular covering, of which the various constituent elements are designed so that their relative positioning, and in particular the alignment and relative orientation of the said elements, are automatic, imposed, invariable and do not require the use of any measuring instrument.

The invention concerns in particular a modular floor covering comprising tiles, complementary framing modules being able to be placed with respect to one another so as to form an exposed grid for framing the tiles, and means for assembly of the framing modules with one another in an orientation which is imposed by the shape of the said modules and/or the structure of the said assembly means.

The inventor has found that it would be desirable to be able to associate various types of framing modules, such as laminas made of wood or laminate or else metal laminas, and any types of tiles - such as terracotta tiles, ceramic tiles, etc., or tiles made of carpet or other synthetic material such as PVC, or tiles made of natural fibres (coir, sisal, seagrass, etc.), or else tiles made of glass. Such a covering would allow anyone to compose, from elements produced and marketed industrially, a unique floor covering according to their own tastes.

The inventor has found furthermore that it would be desirable to have a modular floor covering which is easy to

maintain and whose aesthetic appearance can be modified as desired according to the changing fashions or personal tastes.

FR 2,449,762 describes a flooring comprising modular elements forming a rigid and continuous basic network, tiles and finishing strips. The modular elements comprise, on the one hand, "slotted joints" for attaching the elements to one another, and, on the other hand, "transverse ribs" or fins for supporting the tiles. Each modular element is in the form of a "branch" and has longitudinal "joints" for connecting it to two other aligned elements, and lateral "joints" for connecting it to two other perpendicular elements. The longitudinal "joints" comprise, at one of the longitudinal ends of the branch, a longitudinal tongue provided with lower teeth and, at the other longitudinal end of the branch, a mating longitudinal cavity provided with holes for receiving such teeth. The lateral "joints" comprise, at the middle part of one side of the branch, a lateral tongue provided with teeth and, at the middle part of the other side of the branch, a lateral cavity provided with holes for receiving the teeth of a longitudinal tongue. Thus, each modular element possesses a male-type fastening and a female-type fastening at its longitudinal ends, and a male-type fastening and a female-type fastening at the middle part of its sides, which enable construction of a rigid basic network in all planes. Moreover, each tile, borne by the fins of the modular elements which are adjacent to it, is fixed to the floor by mortar, so that the network itself is also fixed to the floor. Such a flooring is laid permanently and its aesthetic appearance cannot be modified once installed.

EP 178,241 described a flooring which can be dismantled, consisting of filler plates which fit between the arms of crosses formed by connecting elements. Each connecting element has a central cutout, with a thickness equal to half the thickness of the flooring and a length equal to the width of the elements, and two cutouts formed at each of its ends, these cutouts being arranged alternately, one on one face and the other on the opposite face so as to enable connection by end-to-end fitting of the elements. Each connecting element furthermore comprises a rib along each of its lateral edges, which is intended to fit horizontally into a mating lateral groove made in the edge of the adjacent filler plate. The filler plates and connecting elements are thus rigidly fixed to one another. Once installed, such a flooring cannot undergo any aesthetic modification of shape, materials, etc., without being totally dismantled. Moreover, it is laborious to maintain. In addition, the presence of lateral mounting grooves in the filler plates limits the choice of material usable for the production of the said plates, and in particular necessitates the use of thick rigid plates, thereby excluding tiles of carpet, natural fibres, etc.

US-5,438,809 and DE-200 01 412 U1 have different aims from that of the invention and propose floorings or coverings which, like the prior floorings described above, necessitate the use of particular tiles and/or are difficult to maintain and can, where necessary, only be totally dismantled. In particular, US 5,438,809 aims to propose a flooring which can be laid on any floor, without the need for providing a finishing layer. The flooring units, which each comprise a plane and rigid support plate, a plurality of decorative tiles and a compressible frame, are assembled by keys in the form of laths. Each key is

fitted between two adjacent units into corresponding grooves made in the lateral edges of the support plates of the said units.

The invention aims to overcome these disadvantages. In particular, the invention aims to propose a modular floor covering comprising tiles and exposed modules for framing the said tiles, in which the tiles may be of any type, and in particular of terracotta, ceramic, silica mortar, glass, carpet, PVC, natural fibres, wood, laminate, etc. The invention also aims to propose a method of laying a modular covering which allows the use of any types of tiles. In particular, an object of the invention is to allow the use of known tiles of standard dimensions, shapes and materials.

An object of the invention is to propose a floor covering, the maintenance and repair of which are easy and can be carried out by a person without particular aptitude or competence.

The invention also aims to propose a covering and a method of laying the said covering which allow subsequent aesthetic modifications of the covering by a person without particular aptitude or competence.

It also aims to propose such a floor covering which is ready to lay and the laying of which is simple, quick, automatic and does not require any fixing material of the adhesive or cement type, or any tool, with the possible exception of a screwdriver and/or a saw for cutting to the required dimensions an element intended to be laid along the edge of a wall.

Another object of the invention is to propose such a floor covering which can be produced industrially at costs which are low and compatible with marketing to the general public.

Hereinbelow, the various constituent parts of the covering according to the invention are described as being laid on the floor, in an absolute system of reference defined by the floor and a direction orthogonal to the said floor called the vertical direction. An element or plane which is horizontal is an element or plane at least substantially parallel to the floor once the covering is laid.

A strip denotes an element having a main dimension, in a horizontal plane, considerably greater than the others, which defines a longitudinal direction of the strip. This longitudinal direction may be straight or curved; the lateral edges of the strip may be equally either straight or curved or indented, for example. At any point of the strip, a transverse direction of the said strip which is orthogonal to the longitudinal and vertical directions at this point may be defined. A lateral element of a part is an element extending mainly in a plane orthogonal to its transverse direction at an end of the said part.

The invention relates to a modular floor covering comprising tiles and at least one series of identical tile-framing modules which are rigid in at least one plane (which is at least substantially parallel to the floor when the covering is laid), the framing modules of the one or more series being complementary so as to be able to be placed with respect to one another to form an exposed grid for framing the said tiles which has openings of dimensions at least substantially identical to those of the said

tiles, wherein it comprises means for detachable assembly of the framing modules with one another, adapted to impose a relative orientation of the said modules and to connect them rigidly in at least one plane (horizontal), so as to make it possible to produce a rigid framing grid automatically (that is to say without having to define or adjust the relative position of the modules visually or by means of a measuring instrument).

According to the invention, the means for detachable assembly are adapted to allow, once the floor covering has been laid, any one of the framing modules of the covering to be removed by manipulating only the said module and/or the single modules and/or single tiles which are adjacent to it. In particular, in an advantageous version of the invention, the means for detachable assembly are adapted to allow any one of the modules to be removed without having to dismantle or even manipulate another module, including the modules which are adjacent to it (and with which it is directly assembled). It is thus possible to replace a damaged framing module or one whose aesthetic appearance is old-fashioned without having to dismantle the covering totally.

Advantageously and according to the invention, the assembly means are adapted to allow, once the covering has been laid, a first framing module to be dissociated from the framing modules which are adjacent to it by simply displacing the said first module in a vertical direction.

Advantageously and according to the invention, the floor covering comprises a single series of framing modules, which are both identical and complementary. It should be noted that, in one version of the invention comprising at

least two different series of framing modules (the modules of the same series being identical), the modules of one series are complementary to the modules of the other (one or more) series in order to form a frame for each of the tiles.

In a version of the invention with tiles which are square or more generally polygonal, the framing modules of at least one series have a general shape of a straight strip. In particular, in one version of the invention, the framing modules of all the series have a general shape of a straight strip.

In a preferred version of the invention having square or rectangular tiles, the floor covering comprises a first series of identical modules having a general shape of a straight strip of any width and of a length at least substantially equal to a first side of the tiles (dimension in a first direction: length or width for rectangular tiles, side for square tiles), and a second series of identical modules having a general shape of a straight strip of a length at least substantially equal to the sum of twice the width of a module of the first series and twice the other side of the tiles (dimension in a second direction orthogonal to the first direction: width or length for rectangular tiles, side for square tiles). In a variant, the length of the modules of the second series is at least substantially equal to the sum of the width of a module of the first series and the dimension of the tiles in the second direction. It should be noted that in these two versions, the means for detachable assembly are adapted to allow the modules either to be aligned or an angle of 90° to be imposed between them, depending on the two adjacent modules in question.

In a variant, advantageously and according to the invention, the framing modules of at least one series have a general shape of a strip which is not straight, adapted to define at least one angle characteristic of an opening of the grid (formed by the framing modules) or a curved portion characteristic of an opening of the grid. By "strip which is not straight" is meant a strip of curved longitudinal direction - or having at least one curved portion - or a rectilinear strip formed of a plurality of - at least two - straight strips having non-parallel straight longitudinal directions or else a strip having one or more curved portions and one or more rectilinear portions. An angle characteristic of the opening is an angle of a polygonal envelope of the opening. In the same way, by "curved portion characteristic of the opening" is meant a portion of an envelope curve of the opening. This is in order to exclude, in the case of tiles with indented edges for example (the dimensions of the teeth being considerably less than the main dimensions of the tile), the angles or curves formed by the teeth of the tile.

Thus, in this variant of the invention, and in the case of polygonal tiles, the framing modules of at least one series comprise at least two straight strips, the longitudinal directions of which define an interior angle of the said polygon. In other words, the shape of the framing modules is adapted to frame at least one polygon vertex of a tile, that is to say to follow a contour portion of a tile which comprises two consecutive sides of the tile (or a fraction of the said sides extending from their point of intersection called the vertex). In the case of square or rectangular tiles, the framing modules of at least one series each preferably comprise at least two orthogonal

straight strips. In particular, the framing modules each comprise two single orthogonal straight strips, or, in a variant, three straight strips, of which one is orthogonal to the other two.

In a version of the invention in which the floor covering comprises square or rectangular tiles, the framing modules of at least one series each comprise two orthogonal straight strips, one, first, of any width and of a length at least substantially equal to a first side of the tiles (width or length), and the other, second, of a length at least substantially equal to the sum of the width of the first strip and the other side of the tiles (second side orthogonal to the first side: length or width), the first strip being fixed, by a longitudinal end, to the centre of a lateral face of the second strip so as to define the shape of a T.

In a variant, advantageously and according to the invention, the framing modules of at least one series each comprise two first mutually facing parallel straight strips of the same length and of any width (preferably of the same width), each fixed orthogonally, by a longitudinal end, on a lateral face of a third straight strip, facing two sections of this third strip delimiting two end portions of the same length and a central portion of the said third strip, the central portion having a length at least substantially equal to twice the length of an end portion, so that the framing module has the shape of a double T or a Π. The length of the two first strips is at least substantially equal to one side (length or width) of the tiles; that of the third strip is at least substantially equal to the sum of the combined widths of the first and

second strips and twice the other side (width or length) of the said strips.

Advantageously and according to the invention, the means for detachable assembly of two adjacent framing modules, assembled with one another at at least one point, called the assembly point, comprise at least one rigid element formed of two portions, called legs, one of the said legs being intended to fit under one, first, of the framing modules, into a corresponding lower receptacle of the said first module extending from the assembly point, the other of the said legs being intended to fit under the other, second, of the framing modules, into a corresponding lower receptacle of the said second module extending from the assembly point.

In particular, in the case of two adjacent framing modules each comprising at least one straight strip intended to be assembled, by one of its longitudinal ends, with a longitudinal end of a straight strip of the other module, the said strips defining between them an assembly angle which is not zero and differs from 180° (corresponding to an angle characteristic of an opening of the grid; that is to say at least substantially equal to 90° in the case of square or rectangular tiles), the assembly element comprises an angle piece formed of two plane plates or two straight bars (which each correspond to a leg of the element) defining between them an angle corresponding to the said assembly angle. Each of the two strips has, at its longitudinal assembly end, a lower recess or groove extending in the longitudinal direction of the strip and forming a receptacle for receiving one of the plates or bars of the angle piece.

In the case of two adjacent framing modules, each comprising at least one straight strip intended to be assembled, by one of its longitudinal ends, with a longitudinal end of a straight strip of the other module so that the two strips are aligned (they form between them an angle of zero or equal to 180°), the assembly element comprises at least one straight bar or straight plane plate. The said strips each have, at their longitudinal assembly end, a lower recess or groove extending in the longitudinal direction of the strip and forming a receptacle for receiving a portion of the said bar or plate (each portion, for example each half, of the plate or bar defining a leg of the assembly element). In a variant, the two recesses or grooves are offset, and the assembly element comprises two non-aligned parallel bars or plates connected to one another at one of their longitudinal ends.

In the case of two adjacent framing modules, one of which comprises at least one first straight strip intended to be assembled, by one of its longitudinal ends, with a lateral edge of a second straight strip of the other module at a point of the said edge called the assembly point, tne said first and second strips defining between them an assembly angle which is not zero and differs from 180° (corresponding to an angle characteristic of an opening of the grid; that is to say at least substantially equal to 90° in the case of square or rectangular tiles), the assembly element comprises an angle piece formed of two plane plates or two straight bars defining between them an angle corresponding to the said assembly angle. The first strip has a lower recess or groove extending in its longitudinal direction to its longitudinal assembly end and forming a receptacle for receiving one of the plates or bars of the angle piece. The second strip has a transverse

lower notch in its lateral edge at the level of the assembly point, continued by a lower recess or groove extending in its longitudinal direction and forming a receptacle for receiving the other plate or bar of the angle piece. In the case of square tiles, the assembly angle is equal to 90° and the angle piece is a right-angle piece.

In the case of two adjacent framing modules each comprising at least one straight strip intended to be assembled, by one of its lateral edges, with a lateral edge of a strip of the other module so that the two strips are parallel and juxtaposed, the assembly element comprises at least two parallel straight bars or plane plates (each forming a leg of the said element) connected to one another at one of their longitudinal ends by a bottom. The strips each have, in their lateral edge, at their assembly point, a transverse lower notch for receiving the said bottom, and a lower recess or groove extending in their longitudinal direction from the said assembly point and forming a receptacle for receiving one of the said bars or plates.

The fact that the various recesses or grooves for receiving the legs of the assembly element extend in the longitudinal direction of the strips is particularly advantageous in the case of strips produced from extruded metal profiles, as will be explained below. The said recesses or grooves are in this case defined by the actual shape of the profile.

In a preferred version of the invention, the floor covering furthermore comprises means for detachable locking of the means for assembly of two adjacent framing modules, capable of preventing relative displacement of the framing modules and the assembly element. To this end, each of the legs of

the assembly element preferably comprises a plate or plate portion (extending, once the adjacent framing modules are assembled, in the longitudinal direction of the strip of the framing module receiving the said leg) having at least one threaded hole intended to cooperate with a coaxial threaded hole passing through a lateral edge of the framing module facing the receptacle for receiving the said plate, in order to fix each of the framing modules on the assembly element by means of a fixing screw (passing through the lateral edge of the said module and the leg of the facing assembly element) accessible from the said lateral edge of the said framing module. Thus, according to the invention, to remove a framing module from the floor covering, one or more tiles adjacent to the said module is(are) removed to gain access to the screws for fixing the module on the various assembly elements to which it is coupled, the said screws are removed, then the said framing module is lifted in order to dissociate it from the said assembly elements. It is not necessary to dismantle or even manipulate the adjacent framing modules.

In a variant according to the invention:
- the means for detachable assembly of each framing module comprise at least one jointing structure intended to fit, in a vertical direction, into a mating jointing structure of an adjacent framing module,
- each framing module comprises only male-type jointing structures or only female-type jointing structures,
- the covering comprises at least two series of complementary framing modules, a first series of framing modules with male-type jointing structures, and a second series of framing modules with mating female-type jointing structures.

The covering furthermore preferably comprises means for detachable locking of the means for assembly of two adjacent framing modules, capable of preventing relative displacement of the mating jointing structures of the said modules.

In particular, the mating jointing structures are adapted to define, when they are fitted together, a horizontal common bore intended to receive a rod in order to prevent their relative displacement. In a variant (or optionally in combination), the jointing structure of a framing module comprises a vertical tenon intended to fit into a mating vertical mortice of the mating jointing structure of the adjacent framing module. The tenon is in this case preferably produced in an (at least slightly) elastically deformable material and has at least one horizontal shoulder defining a head of the tenon intended to fit with force into a mating head of the mortice in order to prevent the vertical relative displacement of the mating jointing structures.

Advantageously and according to the invention, the framing modules comprise one or more metal profiles, each having an upper receptacle for receiving a decorative lamina such as a wooden lamina, a lamina made of laminate, a metal lamina, a silica mortar, ceramic or terracotta lamina, or else a lamina made of carpet, PVC... By "laminate" is meant a material composed of sawdust amalgamated by means of an adhesive and forming a rigid lamina on which is adhesively bonded at least one sheet of decorative paper, such as a photograph representing the appearance of the wood, coated with a protective layer of resin or wax. Such a material, the cost of which is less than that of unhewn wood, is

particularly solid and resistant; it is commonly used to produce parquet floors.

The metal profile gives the framing module mechanical strength compatible with the working loads intended to be supported by the said module. Moreover, it allows easy and accurate industrial production of the module: profiles of great length are produced by extrusion then cut to the required dimensions to form module strips. The decorative lamina is preferably adhesively bonded on the profile at the factory, so that the module is delivered in its final version ready to be laid.

Advantageously and according to the invention, each metal profile incorporates lower elastic damping means defining an area for supporting the framing module on the floor. These means absorb the noise which could be generated by the impact of the framing module on the floor following mechanical stress such as that caused by a person stepping on the said module. Thus, each metal profile comprises, for example, at least one lower receptacle for receiving a strip made of slightly elastic synthetic material of the rubber or other injection-moulded or profiled foam type, projecting from the profile in the vertical direction. Such lower receptacles of the profile may also serve to receive and hide electric cables.

It should be noted that the covering optionally comprises means for fixing at least one framing module to the floor, such as a fixing collar having at least one horizontal tab screwed into the floor.

Advantageously and according to the invention, each tile is formed of a plurality of superposed elementary sheets,

including at least a lower take-up sheet and an upper finishing sheet. The thickness (dimension in the vertical direction) of the lower take-up sheet is chosen in accordance with the thickness of the upper finishing sheet and the thickness of the framing modules, so that the total thickness of the tile is at least substantially equal, preferably exactly equal, to the thickness of the framing modules.

Each lower take-up sheet is chosen from a sheet made of compressed particules material, rubber, cardboard, rigid foam, etc. (this list is not limiting). The take-up sheet is preferably in an acoustically insulating material and/or one capable of absorbing the mechanical shocks to which the tile is subjected. Depending on the applications, the chosen material is thermally insulating or, in contrast, conductive (notably in the presence of a heated floor). In all cases, it is the least expensive possible.

Each upper finishing sheet is chosen from a terracotta tile, a ceramic tile, a stone tile, a sheet made of synthetic fibres such as a sheet of carpet, a sheet made of synthetic material of the PVC type, a sheet made of natural fibres of the type called sisal or coir or seagrass, a sheet of solid wood or laminate, an aluminium sheet, a stainless steel sheet, a tempered glass tile, a combination of a tempered glass tile and a decorative intermediate sheet chosen from a piece of cloth, a piece of wallpaper, a sheet made of natural fibres of the type called sisal or coir or seagrass or wicker or rattan, a sheet made of synthetic fibres of the carpet type, etc. A translucent or transparent upper sheet (made of glass for example) may optionally be associated with lighting means such as flexible luminescent tubes.

Advantageously and according to the invention, the floor covering comprises square tiles with sides at least substantially equal to 50 cm (standard tiles). The framing modules comprise one or more strips, each having an at least substantially constant width (dimension in the transverse direction) of between 1 cm and 25 cm, preferably between 5 cm and 15 cm, preferably substantially equal to 12.8 cm. Each tile and each framing module has an at least substantially constant thickness of between 10 and 25 mm, preferably of between 15 and 20 mm, in the vertical direction.

To install a floor covering according to the invention, complementary framing modules are juxtaposed and assembled with one another so as to produce an exposed rigid grid for framing tiles, defining openings for receiving the said tiles. In particular, at least one rigid assembly element is arranged between each module and an adjacent framing module, by inserting a first leg of the said element into the corresponding receptacle of one of the framing modules and the second leg into the corresponding receptacle of the other framing module. Where appropriate, each of the two modules is fixed on the assembly element(s) connecting the two modules by means of fixing screws. In a variant, each framing module is assembled with at least one adjacent framing module by vertically fitting together their mating jointing structure(s) and, where appropriate, installing locking means.

Advantageously and according to the invention, the position of the rigid grid - produced by the framing modules - is manually adjusted relative to at least one wall delimiting the floor to be covered. At least one of the framing

modules may optionally be fixed to the floor, by adhesive bonding or by means of a fixing collar having at least one horizontal tab screwed into the floor (such a collar is preferably disposed on the end of a framing module adjacent to a wall, so as to allow the said collar to be concealed by the skirting or quarter-round bead). A lower part of the tiles not contributing to the aesthetic appearance of the covering, such as the lower take-up sheets, may also be adhesively bonded to the floor.

The invention also relates to a floor covering and a method of laying the said covering, characterised by some or all of the characteristics mentioned above and below, in combination.

Other objects, characteristics and advantages of the invention will become apparent on reading the following description which refers to the appended figures showing preferred embodiments of the invention given purely as non-limiting examples, in which:

- Figure 1 is a plan view of two embodiments of floor coverings according to the invention,
- Figure 2 is a schematic view in (vertical) cross-section of a portion of a framing module and of a tile according to the invention,
- Figure 3 is a schematic view in (vertical) cross-section of a portion of another embodiment of a framing module and of a tile according to the invention,
- Figure 4 is a schematic perspective view of portions of two framing modules assembled perpendicularly by a first embodiment of assembly means according to the invention,

- Figure 5 is a schematic perspective view of portions of two framing modules assembled parallel by a first embodiment of assembly means according to the invention,
- Figure 6 is a schematic perspective view of portions of two framing modules assembled perpendicularly by a second embodiment of assembly means according to the invention,
- Figure 7 is a schematic perspective view of portions of two framing modules assembled parallel by a second embodiment of assembly means according to the invention,
- Figure 8 is a schematic view in horizontal section of mating jointing structures of two adjacent framing modules according to the invention,
- Figure 9 is a schematic view in vertical section of the jointing structures of Figure 8,
- Figure 10 is a schematic view in vertical section of another embodiment of jointing structures of two adjacent framing modules according to the invention,
- Figure 11 is a plan view of another embodiment of a floor covering according to the invention.

Figure 1 illustrates a first embodiment of a floor covering according to the invention, comprising exposed framing modules 1, 8, 10, and square tiles 7. The outline of the framing module 1 is drawn in bold lines in order to allow the said module to be clearly delimited. It has the general shape of a double T, produced from three strips 2, 3 and 4: the strips 3 and 4 are welded and/or adhesively bonded and/or fixed orthogonally to the strip 2 by any suitable means, at one of their longitudinal ends 3a, 4a, on a lateral face of the said strip 2. The strips 3 and 4 are

positioned relative to the strip 2 so as to produce a component symmetrical with respect to a transverse plane separating the strip 2 into two equal parts (transverse plane of symmetry of the said strip 2), and in such a way that the two symmetrical portions of the module each have the shape of a T, overall symmetrical with respect to a longitudinal (vertical) plane separating the strips 3 and 4, respectively, into two half-strips of equal width. In a variant, T-shaped framing modules (each corresponding to one of the above-mentioned portions of the double T) may be used.

The strips may be made entirely of metal, preferably with cutouts so as to lighten the structure of the floor covering. They may also be full laminas, made of wood or laminate. In a preferred version, the strips have multiple components: they are produced from metal, preferably aluminium, profiles and have an upper decorative lamina adhesively bonded or fixed by any suitable means on the metal profile. The material of the decorative lamina is chosen in accordance with the desired aesthetic effect. The metal profiles serve as a support for the decorative lamina, and also allow a seal to be produced between the said lamina and the floor. This characteristic is useful especially in the case of a decorative lamina made of wood or laminate which is particularly sensitive to moisture, not only to preserve the said lamina once the floor covering has been laid, but also to allow the covering to be laid on a floor which has just been formed and is still relatively moist. In the absence of the metal profile, such a lamina made of wood or laminate can only be laid on a perfectly dry floor or support. Consequently, the drying times of the said floor must be strictly adhered to and the time it takes to produce the covering may be considerably

increased, especially in the case of a floor comprising a screed with a relatively high water content such as a screed formed on a heated floor of the electrical radiant type or other hydraulic floor (such a screed requires a drying time varying from 1 to 8 months depending on the ambient humidity). The presence of the metal profile supporting and protecting the decorative lamina allows the framing modules to be laid on a floor which is still relatively moist, and thus permits a considerable reduction in the time taken to produce the floor and the floor covering.

The profiles used have typically an outside width of 12.8 cm. They preferably comprise vertical lateral flanges 5 (see Figure 2) with a width of 0.15 cm, defining a receptacle 59 for receiving a decorative lamina 6 with a width of 12.5 cm, made of wood, laminate, metal... The vertical lateral flanges 5, which are flush with the surface of the decorative lamina 6 (surface of the finished floor, which is also level with the upper faces of the tiles 7), advantageously protect the upper edges of the decorative lamina 6. In a variant, the metal profiles consist of a single base for supporting the decorative laminas. The length of the strips 3 and 4 is at least substantially equal to the size of the tile 7, 50 cm in the example, which is the standard size of the known square tiles. The length of the strip 2 is at least substantially equal to 125.6 cm. Metal profiles of great length, typically of the order of 7 m, are machined (extruded), then cut at the factory to the above-mentioned lengths; the rails thus obtained are welded to form framing modules. In the same way, laminas of laminate or wood of great length are respectively manufactured or converted, then cut to the desired lengths and adhesively bonded on the aluminium

rails. In a variant, the laminas and profiles of great length are assembled prior to cutting. Each framing module is delivered finished, ready to be laid on the floor. The laying of the floor covering according to the invention does not require any operation for adhesively bonding elements to one another, so that the total laying time is reduced by the usual adhesive-bonding and drying times of the known adhesively bonded coverings. Such a framing module has a total weight less than that of a module made of solid wood or entirely of metal, for an equivalent mechanical strength and life.

Figure 1 also illustrates another embodiment of the invention, comprising straight framing modules 20, 21, 22, 23, 221, 222. Each of these framing modules comprises a single straight strip. The modules 21, 22, 221, 222 have a length substantially equal to 50 cm (size of the tile), and a width of the order of 12.8 cm. The modules 20 and 23 have a length at least substantially equal to 125.6 cm, and a width of the order of 12.8 cm. Such modules are particularly easy to pack and store.

Figure 2 illustrates a cross-section of the strip 2 (or of the strips 3 and 4) of the framing module 1 and of a portion of the tile 7 adjacent to the said strip. The metal profile of the said strip 2 has two vertical lateral flanges 5 (only one of which is illustrated in Figure 2) and a lower web 14, defining a receptacle 59 for receiving the lamina 6. A lamina 13 made of elastic and/or acoustically and/or thermally insulating synthetic material, such as a lamina made of rubber, is adhesively bonded on the lower face of the web 14, so as to absorb the shocks of the profile on the floor which could occur in the absence of the said insulating lamina when a person walks

on the strip, and thus absorb the subsequent noise generated, and/or acoustically insulate a room situated on a storey below the room in which the floor covering is laid, and/or thermally insulate the profile and the decorative lamina 6 from the floor 43 on which the covering is laid (called the rough floor). It should be noted that the said insulating lamina 13 is advantageously adhesively bonded on the profile prior to cutting of the latter to the desired lengths to produce the framing modules. In a variant, the insulating lamina and the profile have complementary dovetail structures for their assembly. The total thickness (dimension in the vertical direction) of the strip 2 thus obtained is about 20 mm.

The tile 7 consists of a take-up sheet 17 made of compressed particules material with a thickness of 4 to 6.5 mm, a decorative sheet 16, such as a square of wallpaper or a sheet made of woven or adhesively bonded natural or synthetic fibres (sisal, coir, seagrass, cloth, carpet...) with a thickness of 0.5 to 3 mm, and a sheet 15 made of tempered glass with a thickness of about 13 mm, so that the tile 7 has a thickness of the order of 20 mm, preferably exactly equal to that of the framing modules. The sheets are superposed on one another during the laying of the floor covering, the take-up sheet being laid directly on the floor in the grid opening delimited by the adjacent framing modules previously laid. It is not necessary to adhesively bond the said sheets. It is thus easy to remove a tile in order to replace it, if damaged or broken, or for aesthetic purposes (replacing the decorative sheet 16 alone or the whole tile, according to the fashions and changing personal tastes or for the purpose of matching the floor covering with a new wallpaper or new furniture). It should be noted that it is possible to combine different tiles

(finished floor 44 of carpet, glass, terracotta...) in the same room, and thus to create any possible ambience and design. The only condition to this diversity is to design tiles with the same total thickness, corresponding at least substantially, preferably exactly, to the thickness of the framing modules. Since the finishing sheets are chosen from known standard sheets, a limited range of lower take-up sheets, with thicknesses predefined according to the existing finishing sheets, may be proposed.

Figure 3 illustrates another embodiment of framing modules and tiles according to the invention. The framing module 1bis, seen in cross-section, comprises a metal support profile comprising two vertical lateral flanges 5bis and a lower web 18, the cross-section of which advantageously has cutouts in places so as to lighten the profile without affecting its mechanical strength. The web 18 comprises lower receptacles 58 for receiving longitudinal strips 19 made of rubber or other slightly elastic and/or insulating material, making it possible in particular to absorb the vertical shocks to which the framing module is subjected. The embodiment illustrated comprises four insulating strips of ovoidal shape in contact with the rough floor 57; any other shapes and distributions of the insulating strips are in accordance with the invention. In the same way, the section of the web of the metal profile used to produce the framing modules is not limited to that illustrated. It should also be noted that the cutouts of the web of the metal profile may be used for running electric cables.

The tiles 7bis each comprise a lower sheet 56 made of rubber having a thickness of the order of 2 mm, a take-up sheet 24 made of compressed particules material with a thickness of 10 to 15 mm, and a carpet sheet 23 with a

thickness of 3 to 8 mm, these three elements combining to give a tile with a thickness of 20 mm.

The floor covering according to the invention may be laid floating or, in a variant, adhesively bonded. Floating laying is preferred for its speed (no time needed for adhesive bonding of the elements or drying of the adhesive). Moreover, it facilitates subsequent changing of a tile and/or a framing module. The framing modules are laid and assembled successively: a first module is laid, then a second which is assembled with the first, then a third which is assembled with the second and/or the first, and so on to produce a rigid grid covering the whole room, without worrying about the relative position of the modules, which is automatically adjusted by their shape and the structure of their assembly means. The modules 1, 8, 10 in the shape of a double T may be arranged in staggered form or, in a variant, aligned facing one another.

Next, the tiles are arranged, by vertical embedding, in the openings produced by the framing modules, which have geometrical shape(s) and dimensions identical to those of the tiles, except for a clearance of less than 1 mm (preferably less than 0.5 mm), allowing the fitting of the tiles. The tiles are laid directly on the floor and are preferably neither adhesively bonded to the floor, nor fixed or adhesively bonded to the modules which frame them. Consequently, each tile can be laid or removed without having to displace the adjacent framing modules.

What are called end framing modules, situated along the edge of the walls of the room to be covered, are where necessary cut to the required dimensions by means of a saw, so as to allow each of the said modules to be fitted

between the wall and the framing module(s) which is/are adjacent to it.

What are called end tiles, situated along the edge of the walls of the room, are where necessary cut to the dimensions of the areas on the floor which are delimited by the end framing modules and the adjacent wall. Customary peripheral skirtings (or quarter-round beads) are arranged on the end edges of the end tiles and end framing modules, and are adhesively bonded on the adjacent walls. The laying procedure is simple and quick, the relative positioning of the framing modules taking place without the possibility for error. It may be carried out by anyone, requiring no particular aptitude.

According to a first embodiment of the means for detachable assembly, illustrated in Figures 4 and 5, the framing module 20 comprises two opposite longitudinal lower receptacles 69, 68 made in the metal profile of the said module along its lateral edges 52, 53. Since the metal profile is produced by extrusion, the receptacles 68, 69 are designed with the same shape as the profile and extend over the entire length of the framing module. The adjacent framing module 21, disposed perpendicularly to the module 20, is preferably produced from the same metal profile; it has a lateral lower receptacle 83 extending longitudinally along its lateral edge 80, and a similar receptacle 84 along its opposite lateral edge 81. The framing module 20 furthermore has, in the region 20a where the modules 20 and 21 are assembled, two notches 67, 82 cut out of its lateral edge 52 and spaced by a distance corresponding substantially to the distance separating the two lateral receptacles 83, 84 of the adjacent module 21 (distance slightly less than the width of the module 21). The means

for detachable assembly of the modules 20 and 21 furthermore comprise two right-angle pieces 60, 61, each formed of two plane plates extending in orthogonal planes (these planes are vertical when the right-angle piece is observed in its final assembly position). The plate (or leg) 62 of the right-angle piece 60 is intended to fit vertically into the receptacle 69 of the framing module 20; the plate (or leg) 63 of the said right-angle piece is intended to fit vertically into the notch 67 of the module 20 and the receptacle 83 of the module 21. The plate 62 has a hole 64 for receiving a fixing screw and intended to cooperate with a hole 66 made in the edge 52 of the module 20; the plate 63 of the right-angle piece has a hole 65 for receiving a fixing screw and intended to cooperate with a hole 85 made in the edge 80 of the module 21. The right-angle piece 60 associated with the above-mentioned fixing screws makes it possible to produce a rigid connection between the modules 20 and 21 on a first side of the longitudinal end 21a of the module 21. The right-angle piece 61 is identical to that described above and makes it possible to produce a similar connection between the modules 20 and 21 on the other side of the longitudinal end 21a of the module 21. The module 20 has three other pairs of notches cut out of its lateral edges 52, 53 in the assembly regions 20b, 20c, 20d in order to allow it to be fixed to the framing modules 22, 222, 221 by means of right-angle pieces.

The module 20 is additionally joined at its longitudinal end 54 to the longitudinal end 55 of the adjacent identical module 23. For this purpose, it has a first lateral hole 77 made in its lateral edge 52 close to the longitudinal end 54, and a second hole made in its lateral edge 53 in alignment with the first hole. The hole 77 thus opens onto

the receptacle 69; the opposite hole (not designated) opens onto the receptacle 68. The module 23, produced from the same metal profile, similarly comprises two longitudinal lower receptacles 79, 86 along its lateral edges 71, 72. It has, close to its longitudinal end 55, a first hole 78 made in the lateral edge 71 and opening onto the receptacle 79, and a second hole (not designated) made in the lateral edge 72 and opening onto the receptacle 86. The means for assembly of the modules 20 and 23 furthermore comprise a first plate 73 interposed between the two modules and fitted partly into the receptacle 69 of the module 20 and partly into the receptacle 79 of the module 23, and a second plate 74 fitted partly into the receptacle 68 of the module 20 and partly into the receptacle 86 of the module 23. The plate 73 comprises two holes 75, 76 intended to cooperate respectively with the holes 77 and 78 for receiving a fixing screw; the plate 74 likewise comprises two holes intended to cooperate respectively with the holes (not designated) passing through the lateral edges 53 and 72.

The module 20 is therefore associated with two plates 73, 74 for fixing it to the module 23 by its longitudinal end 54, two identical plates at its other longitudinal end, and eight right-angle pieces 60, 61 for fixing it to the modules 21, 22, 221, 222. To dismantle such a module, all that is required is to remove the tiles which are adjacent to it (six tiles in total), unscrew the twelve fixing screws passing through its two lateral edges (the screws are accessible horizontally from the space initially occupied by the removed tiles), then lift the said framing module. The framing module 22 is associated with four right-angle pieces. To dismantle such a module, all that is required is to remove the two tiles which are adjacent to

it, unscrew the four fixing screws passing through its two lateral edges (the screws are accessible horizontally from the location of the removed tiles), then lift the said framing module.

A second embodiment of the means for detachable assembly according to the invention is illustrated in Figures 6 and 7. For fixing it to a perpendicular straight framing module 101, the straight framing module 100 comprises two lateral flanges 115, 116, extending horizontally beyond its lateral edge 103 at a distance from the floor (that is to say from the lower surface of the module in contact with the floor). Each flange 116, 115 thus defines a lower receptacle 116a, 115a. It should be noted that these flanges form an integral part of the metal profile of the module 100. The extruded metal profile used to produce the said module comprises initially, running on from the lateral edge 103, a single flange extending over the entire length of the profile. This flange is then cut out at various points corresponding to the future assembly regions of each of the modules produced from the profile, in order to form in particular the flanges 115 and 116 of the module 100 shown. The module 101, preferably produced from the same metal profile, has two lateral horizontal flanges 104, 105. The means for assembly of the module 100 and the module 101 furthermore comprise two right-angle pieces 106, 113, each formed of two plane plates extending in the same plane. The plate (or leg) 107 of the flat right-angle piece 106 is intended to fit under the lateral flange 116 of the framing module 100; the plate (or leg) 108 of the said right-angle piece is intended to fit under the lateral flange 105 of the adjacent framing module 101. The longitudinal ends 128, 129 of the lateral flanges 116, 105 are cut slantwise, at 45°, so as to be able to butt against one another when the

modules are assembled. The plate 107 of the flat right-angle piece 106 has a vertical hole 109 for receiving a fixing screw and intended to cooperate with a vertical hole 112 made in the flange 116 of the module 100; the plate 108 of the said right-angle piece has a vertical hole 110 for receiving a fixing screw and intended to cooperate with a vertical hole 111 made in the flange 105 of the module 101. The flat right-angle piece 106, associated with the two above-mentioned fixing screws, makes it possible to impose the relative orientation of the two modules 100, 101, and to connect them rigidly to one another on a first side of the longitudinal end of the module 101. The right-angle piece 113 produces a similar connection on the other side of the longitudinal end of the said module 101.

The framing module 100 is additionally connected, by one of its longitudinal ends, to a module 130 having two opposite horizontal lateral flanges 124, 125. The framing module 100 has two similar flanges 127, 126, running on from the flanges 116, 123, respectively. The means for assembly of the modules 100 and 130 furthermore comprise a first plate 119 interposed between the two modules and fitted partly under the flange 127 of the module 100 and partly under the flange 124 of the module 130, and a second plate 120 fitted partly under the flange 126 of the module 100 and partly under the flange 125 of the module 130. The plate 119 comprises two holes 121, 122 intended to cooperate, respectively, with holes 117, 118 passing vertically through the flanges 127, 124 for receiving a fixing screw; the plate 120 likewise comprises two holes intended to cooperate respectively with two holes (not designated) passing through the lateral flanges 126, 125. The plates 119, 120 and associated screws produce two rigid

connections of the modules 100 and 130 on each side, laterally, of the said modules.

The tiles associated with such modules each comprise a take-up sheet, made of compressed particules material for example, the area of which corresponds to the area on the floor delimited by the outer edges of the lateral flanges of the adjacent framing modules. The thickness of this take-up sheet is chosen such that the sheet is flush with the level of the upper horizontal surface of the said flanges. A finishing sheet of greater dimensions is laid on this take-up sheet; it rests likewise on the lateral flanges of the adjacent framing modules so as to cover the said flanges totally. To dismantle such a module, all that is required is to remove the tiles which are adjacent to it (it is possible to remove merely the finishing sheets of the said tiles...), remove the screws for fixing the said module to the flat plates and right-angle pieces with which it is associated (the screws are accessible vertically from the locations of the removed finishing sheets), and lift the module.

According to a third embodiment of the means for detachable assembly, illustrated in Figures 8 and 9, the framing module 1 comprises, at the free longitudinal end 12 of its strip 3, a recessed jointing structure 26, called a female jointing structure, formed in particular of lower grooves 31 made, in the longitudinal direction, in the web 14 of the metal profile of the said strip 3 and defining ribs 32. The said ribs 32 are traversed in the transverse direction by a bore 27. The web 14 of the metal profile thus has at its end 12 an alternate arrangement, in the transverse direction, of teeth (or ribs) 32 and grooves 31, surmounted by the decorative lamina 6, the end transverse face 6a

(also called the longitudinal end) of which runs on vertically from the end face 32a of the teeth 32, so as to conceal the jointing structure 26.

The adjacent framing module 8 possesses a mating jointing structure 25, called a male jointing structure, projecting, in the transverse direction of its strip 46, from the lateral face 45 of the said strip (or more precisely from its metal profile 47 on which the structure 25 is welded). The jointing structure 25 has an alternate arrangement, in the longitudinal direction of the strip 46, of ribs 30 - intended to fit into the grooves 31 of the neighbouring module 1 - and of grooves 33 - intended to receive the ribs 32 of the module 1 -. The ribs 30 are penetrated by a bore 28 of the same section as the bore 27 of the structure 26. The fitting-together of the two mating structures may take place in the longitudinal direction of the strip 3 of the module 1 (which corresponds to the transverse direction of the strip 46 of the module 8) if there is sufficient space in the surrounding area, or else in the vertical direction: to this end, the structure 26 of the strip 1 is positioned above and vertically in line with the structure 25 of the structure 25 of the strip 8. The bores 26 and 27 are produced in such a way that they coincide to form a single horizontal common cylindrical bore when the two jointing structures are assembled, and when the end faces 32a and 6a, respectively of the profile 14 and of the decorative lamina 6 of the module 1, are butting against the face 45 of the profile 47. The said common bore is intended to receive a rod 29, in order to securely fasten the two structures (and therefore the two adjacent modules). A thread is machined in any one of the ribs 30 or 32, and the rod used is a screw (or a rod threaded over at least part of its body, for example over a length of the order of the

width of the threaded rib 30). In a variant, the bores 26 and 27 are smooth and the rod used is a gudgeon or other pin.

According to a fourth embodiment of the means for detachable assembly according to the invention, illustrated in Figure 10, the module 1bis has, at the longitudinal end 12bis of one of its strips, a recessed jointing structure 34, called a female structure, comprising a vertical mortice 37 (or vertical bore) made in a thickness of its metal profile 18 and set back, in the longitudinal direction, from the end faces 6a and 18a, respectively, of the decorative lamina and of the metal profile of the said strip. The mortice is intended to receive a tenon 36 of a male jointing structure 35 projecting in the transverse direction from the strip 46bis of the adjacent framing module 8bis (projecting structure). The tenon 36 is formed at a distance from the lateral face 45bis of the said strip 46bis which is adapted so that the end faces 6a and 18a of the module 1bis are butting against the said face 45bis when the jointing structures are fitted together. In a variant, the tenon is formed at a distance from the lateral face 45bis which is adapted so that there is a clearance between the faces 6a, 18a and 45bis which facilitates the fitting together of the structures 34 and 35, the said clearance being chosen to be minimal and preferably less than 0.5 mm. The mortice 37 is preferably equipped with shoulders 39 on which mating shoulders 38 of the tenon 36 are intended to rest. The shoulders 38 and 39 prevent any vertical relative displacement of the jointing structures once the latter are fitted into one another. The fitting together of the structures 34 and 35 takes place vertically by positioning the end 12bis of the module 1bis above and facing the jointing structure 35 of the module 8bis, and by

inserting the tenon 36 into the mortice 37. Given the shape of the tenon 36 and mortice 37 defining a head 61 of the tenon and a mating head 60 of the mortice, the person who installs the floor covering has to exert a certain pressure on the end 12bis of the module 1bis to enable the fitting together, by tapping on the said end using his foot or any suitable object (small mass for example). Moreover, it is preferable for at least one of the jointing structures, preferably the tenon 36, to be designed in a slightly flexible and elastic material to facilitate the fitting together of the structures and guarantee the effectiveness of the locking means (shoulders 38 and 39). It should be noted that jointing structures made of aluminium (in the case of profiles 18 and 47bis made of aluminium) are in accordance with the invention. It should be noted that such a framing module can be removed without the need to remove an adjacent tile.

In these (third and fourth) embodiments with jointing structures, each framing module comprises only jointing structures of the same type, that is to say either male (projecting and/or with a tenon) or female (recessed and/or with a mortice), whether it is a matter of lateral jointing structures or end jointing structures (at the longitudinal ends). To dismantle a framing module having only female structures, all that is required is to lift the said module in order to uncouple its jointing structures from the mating jointing structures of the adjacent modules (it is not necessary to manipulate the said adjacent modules), after first removing, where appropriate, the adjacent tiles and the rods for locking the said jointing structures. To dismantle a framing module having only male structures, it is advisable first to dismantle the modules (with female jointing structures) which are adjacent to it.

The floor covering according to the invention can be laid on any floor: concrete flooring, screed, wooden flooring, etc. It is not necessary for the floor to be perfectly smooth. A rough or uneven flooring can be covered with the covering according to the invention, provided that the height does not exceed 5 mm over 2 m.

Figure 11 illustrates another embodiment of the invention comprising framing modules 40 with four strips forming a peripheral frame of a tile 41. Such modules are each associated with at least four assembly elements (not shown) for connecting them to four adjacent modules. Each decorative lamina has a mitre at each of its ends for joining it to the neighbouring orthogonal lamina. In a variant, it has straight ends.

It goes without saying that the invention may have numerous variants from the embodiments described above and shown in the figures.

In particular, the framing modules may have a different shape from those described and illustrated, provided that this shape and/or the assembly means allow them to be positioned in a simple and systematic manner with respect to one another, without, in particular, having to measure a distance or a relative angle, and allow the construction of a rigid grid for receiving the tiles.

Moreover, the tiles may be of any geometrical shape, and in particular polygonal. In the case of hexagonal tiles, each framing module comprises, for example, five strips, four of which are of the same length, two strips of the same length being fixed to each longitudinal end of the fifth strip so

as to form angles of 120° between them and with the said fifth strip. In a variant, octagonal tiles may be associated with square tiles to form a covering according to the invention. The corresponding framing modules are, for example, formed of 2 symmetrical portions defining, with respect to one another, on one of their lateral faces, a right angle corresponding to a vertex of a square tile, and each defining, on their other lateral face two angles corresponding to two consecutive vertices of an octagonal tile. A floor covering with round tiles, etc. may also be envisaged. It should be noted, however, that such coverings are of higher cost than those with square or rectangular tiles, since, for the production of a framing module, they require a greater number of operations for cutting and/or welding profiles and decorative laminas.